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Patentanmeldung Nr. Patent application No. Demande de brevet n°

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**Blatt 2 der Bescheinigung
Sheet 2 of the certificate
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Fibrous material comprising fiber made from linear, isotactic polymers

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**FIBROUS MATERIAL COMPRISING FIBERS MADE FROM LINEAR,
ISOTACTIC POLYMERS**

5

Bernhard Rieger

FIELD OF THE INVENTION

10 The present invention relates to fibrous web materials such as nonwoven materials used for example in hygienic articles. Specifically, the present invention relates to elastic fibrous web materials.

BACKGROUND

15 Fibrous materials and in particular nonwoven web materials comprising olefinic polymers are well known in the art and enjoy widespread usage throughout the industry. Typical areas of application of such fibrous web material include for example hygienic articles and in particular disposable absorbent articles.

20 Fibrous web materials comprising commonly used polyolefins such as PP, PE, PS, PIB have a number of useful properties. They are bio-compatible and food compatible, chemically stable, inert, non toxic materials. However, most of them have poor mechanical properties including insufficient strength/tear resistance, insufficient stretchability/elasticity and the like.

25

 Several approaches have been proposed in the prior art to provide elastic properties to such fibrous web materials. The most commonly used approach is based on changing the chemical structure of the polymer by introducing hinged joints/moieties into the main chain of the polymer. These hinges provide more

flexibility to the polymeric backbone preventing crystallization of polymer, lowering the glass transition temperature (T_g) and improving the elasticity of the resulting material. Usually, the hinge groups contain heteroatoms providing flexibility such as oxygen, nitrogen or chlorine placed into the main chain or into bulky side groups. Another approach is mastication of the polymer by blending with special plasticizing agents. Both approaches, however, require heteroatoms to be introduced into the molecule or into the bulk of the coating material.

10

The third approach proposed in the prior art to provide elastic properties to such fibrous web materials, which is more close to the present invention, is to exploit the formation of hetero-phases which reinforce the bulk material by forming a physical net. To do this the block-co-polymerization of two or more different monomers has been used leading to polymeric backbones comprising blocks with different T_g. This results in micro-phase separation in the bulk with formation of reinforcing crystalline domains of one co-polymer linked with each other by flexible chains of the second co-polymer.

15

In essence, conventional polymeric web materials carry a wide variety of inherent disadvantages including but not being limited to insufficient strength/tear resistance, insufficient stretchability/elasticity, not being bio-compatible, not being food compatible, comprising heteroatoms such as chlorine and hence leading to toxic residues when burnt, and the like.

20

It is an object of the present invention to provide fibrous web materials which overcome the disadvantages of the prior art fibrous web materials.

25

It is a further object of the present invention to provide articles which comprise fibrous web materials.

30

It is a further object of the present invention to provide a method for manufacturing fibrous web material of the present invention.

It is a further object of the present invention to provide a method processing a fibrous web material of the present invention.

5

SUMMARY OF THE INVENTION

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The present invention provides a fibrous web material comprising a plurality of fibers. The fibrous web material is characterized in that the fibers comprise linear isotactic polymers having a structure of one or several C_2 to C_{20} olefins, the isotacticity of the polymers, due to a statistic distribution of stereoscopic errors in the polymer chain, being within the range of 25% to 60% of [mmmm] pentad concentration with the proviso that an arbitrary or rather regular sequence of isotactic and atactic blocks is excluded, the polymer having a mean molecular weight M_w within the range of from 100000 to 800000 g/mol and a glass temperature T_g of between -50 to +30 °C.

15

The present invention further provides a method for manufacturing fibers from the aforementioned polymeric material comprising a step of processing the polymeric material selected from the group of wet spinning, dry spinning, melt spinning, semi dry spinning (solvent evaporation or sedimentation), and combinations thereof.

20

The present invention further provides a method for manufacturing a fibrous web material comprising the steps of providing fibers of the aforementioned polymeric material and of combining the fibers into a web material.

25

The present invention further provides a method for stabilizing a fibrous web material according to the present invention comprising the steps of providing a fibrous web material and of stabilizing step the fibrous web material.

DETAILED DESCRIPTION OF THE INVENTION

5 The present invention provides fibrous web materials comprising linear or branched isotactic polymers having a structure of one or several C₂ to C₂₀ olefins. The isotacticity of the polymers, due to a statistic distribution of stereoscopic errors in the polymer chain, is within the range of from 25% to 60% of [mmmm] pentad concentration with the proviso that an arbitrary or rather regular sequence of isotactic and atactic blocks is excluded. The mean molecular weight M_w of the
10 polymer is within the range of from 100000 to 800000 g/mol and the glass temperature T_g is between -50 and +30 °C.

These polymers exhibit a semi-crystalline structure. The structure contains elastic amorphous areas of nano-scale-size reinforced with self arranged
15 crystalline domains of nano-crystals. The formation of brittle macro-crystalline material from the polymer is achieved by introducing the defects into the polymeric backbone. Isolated monomer units with opposite stereo configuration have been used as the defects, i.e. single stereo errors.

20 The polymers and a process for manufacturing such polymers are described in PCT patent application EP99/02379 incorporated herein by reference. A catalyst combination suitable for the preparation of such polymers is described in PCT patent application EP99/02378 incorporated herein by reference. These polymers differ in their elastic-thermoplastic behavior from the state of the art as
25 represented for example by EP-A- 0 707 016. In particular, the polymers used in manufacturing the fibrous web materials of the present invention have a distinctive rubber-elastic plateau in their tensile-strength curves. The polymers of the present invention are bio-compatible may be burnt without toxic residues since they contain no heteroatoms such as chlorine.

There are known in the art a wide variety of suitable methods to manufacture and /or process fibers from the polymer of the present invention including but not being limited to wet spinning, dry spinning, melt spinning, semi dry spinning
5 (solvent evaporation or sedimentation), crazing, and combinations thereof. Fibers suitable for the web materials of the present invention may be mono fibers or the may comprise filaments.

There are known in the art a wide variety of suitable methods to manufacture
10 fibrous web materials according to the present invention from fibers including but not being limited to meltblowing, spunbonding, carding, air laying, wet laying, weaving, knitting, bailing, and the like. There are further known in the prior art a wide variety of suitable methods for optional stabilization of the fibrous web material of the present invention including but not being limited to hydroentangling,
15 thermo bonding, pressure bonding, air through bonding, needling, resin bonding, combinations thereof, and the like.

It is a further aspect of the present invention to provide an article comprising a fibrous web material according to the present invention.

20

The article according to the present invention may be a hygienic article. The term "hygienic article" as used herein refers to articles which are intended to be used in contact with or in proximity to the body of a living being. Such hygienic articles may absorbent or non-absorbent. Such hygienic articles may be
25 disposable or intended for multiple or prolonged use. Such hygienic articles include but are not limited to disposable absorbent article (diapers, sanitary napkins, adult incontinence devices such as briefs, bed mats, wound plasters, underarm sweat pads, and the like), medical supply items (coverings, gowns, drapes, face masks, bandages, body implants, and the like), and other hygienic
30 articles such as toys, bed covers, and the like. Having regard to the specific advantages of the polymers used for the articles of the present invention, it will be readily apparent to the skilled practitioner to apply the fibrous web materials according to the present invention in the above and similar hygienic articles.

The article of the present invention may also be a clothing article or a household article including but not being limited to bed covers, underwear, tights, socks, gloves, sport clothing, outdoor clothing, low temperature clothing, shoes and show covers, protective clothing such as for motor biking, blankets, covers, bags, items of furniture, and the like. Having regard to the specific advantages of the polymers used for the articles of the present invention, it will be readily apparent to the skilled practitioner to apply and to optionally modify the fibrous web materials according to the present invention in the above and similar articles.

The fibrous web material according to the present invention may also be used as a construction element in an article. Thereby, the functionalities of the fibrous web material includes but is not limited to supporting, carrying, fixing, protecting other elements of the article and the like. Such articles include but are not limited to adhesive tapes, protective wraps, complex constructions such as buildings (floor coverings, house wraps, and the like), cars, household appliances, horticultural and agricultural constructions (geotextiles), and the like. Having regard to the specific advantages of the polymers used for the articles of the present invention, it will be readily apparent to the skilled practitioner to apply and to optionally modify the fibrous web materials according to the present invention as construction elements in the above and similar articles.

The article of the present invention may further a membrane such as in filters, car batteries, and the like. Having regard to the specific advantages of the polymers used for the articles of the present invention, it will be readily apparent to the skilled practitioner to apply and to optionally modify the fibrous web materials according to the present invention in the above and similar articles.

CLAIMS

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1. A fibrous web material comprising a plurality of fibers characterized in that said fibers comprise linear isotactic polymers having a structure of one or several C₂ to C₂₀ olefins, the isotacticity of said polymers, due to a statistic distribution of stereoscopic errors in the polymer chain, being within the range of 25% to 60% of [mmmm] pentad concentration with the proviso that an arbitrary or rather regular sequence of isotactic and atactic blocks is excluded, the polymer having a mean molecular weight Mw within the range of from 100000 to 800000 g/mol and a glass temperature T_g of between -50 to +30 °C.
2. A fibrous web material according to Claim 1 wherein said linear, isotactic polymer is polypropylene.
3. An article comprising a fibrous web material according to any of the proceeding claims.
4. An article according to Claim 3 wherein said article is a hygienic article.
5. A hygienic article according to Claim 4 wherein said article is a disposable absorbent article.
6. An article according to Claim 3 wherein said first element is a construction element of the article.
7. A method for manufacturing fibers from polymeric material comprising a step of processing said polymeric material selected from the group of wet spinning, dry spinning, melt spinning, semi dry spinning (solvent evaporation

5 or sedimentation), and combinations thereof
characterized in that
said polymeric material comprises a linear isotactic polymers having a
structure of one or several C_2 to C_{20} olefins, the isotacticity of said polymers,
due to a statistic distribution of stereoscopic errors in the polymer chain,
being within the range of 25% to 60% of [mmmm] pentad concentration with
10 the proviso that an arbitrary or rather regular sequence of isotactic and
atactic blocks is excluded, the polymer having a mean molecular weight Mw
within the range of from 100000 to 800000 g/mol and a glass temperature T_g
of between -50 to +30 °C.

8. A method for manufacturing a fibrous web material comprising the steps of
15 - providing fibers of polymeric material
- combining said fibers into a web material
characterized in that
said fibrous web material comprises a linear isotactic polymers having a
structure of one or several C_2 to C_{20} olefins, the isotacticity of said polymers,
20 due to a statistic distribution of stereoscopic errors in the polymer chain,
being within the range of 25% to 60% of [mmmm] pentad concentration with
the proviso that an arbitrary or rather regular sequence of isotactic and
atactic blocks is excluded, the polymer having a mean molecular weight Mw
within the range of from 100000 to 800000 g/mol and a glass temperature T_g
25 of between -50 to +30 °C.

9. A method for manufacturing a fibrous web material according to Claim 8
wherein
said step of combining fibers is selected from the group of meltblowing,
spunbonding, carding, air laying, wet laying, weaving, knitting, bailing, and
30 combinations thereof.

10. A method for stabilizing a fibrous web material comprising the steps of

- providing a fibrous web material

5 - stabilizing step said fibrous web material

characterized in that

said fibrous web material comprises a linear isotactic polymers having a structure of one or several C_2 to C_{20} olefins, the isotacticity of said polymers, due to a statistic distribution of stereoscopic errors in the polymer chain, being within the range of 25% to 60% of [mmmm] pentad concentration with the proviso that an arbitrary or rather regular sequence of isotactic and atactic blocks is excluded, the polymer having a mean molecular weight M_w within the range of from 100000 to 800000 g/mol and a glass temperature T_g of between -50 to +30 °C.

15 11. A method for stabilizing a fibrous web material according to Claim 10 wherein

said step of stabilizing is selected from the group of hydroentangling, thermo bonding, pressure bonding, air through bonding, needling, resin bonding, combinations thereof.

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ABSTRACT

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The present invention relates to fibrous web materials comprising polymeric material wherein the structure of the polymeric material contains elastic amorphous areas of nano-scale-size reinforced with self arranged crystalline domains of nano-crystals.

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Message for the Attention of

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From Sonia Kohol

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